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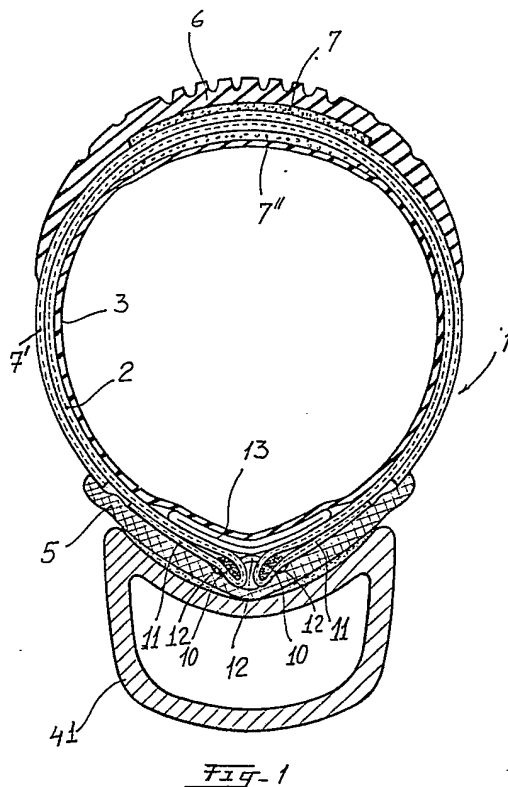
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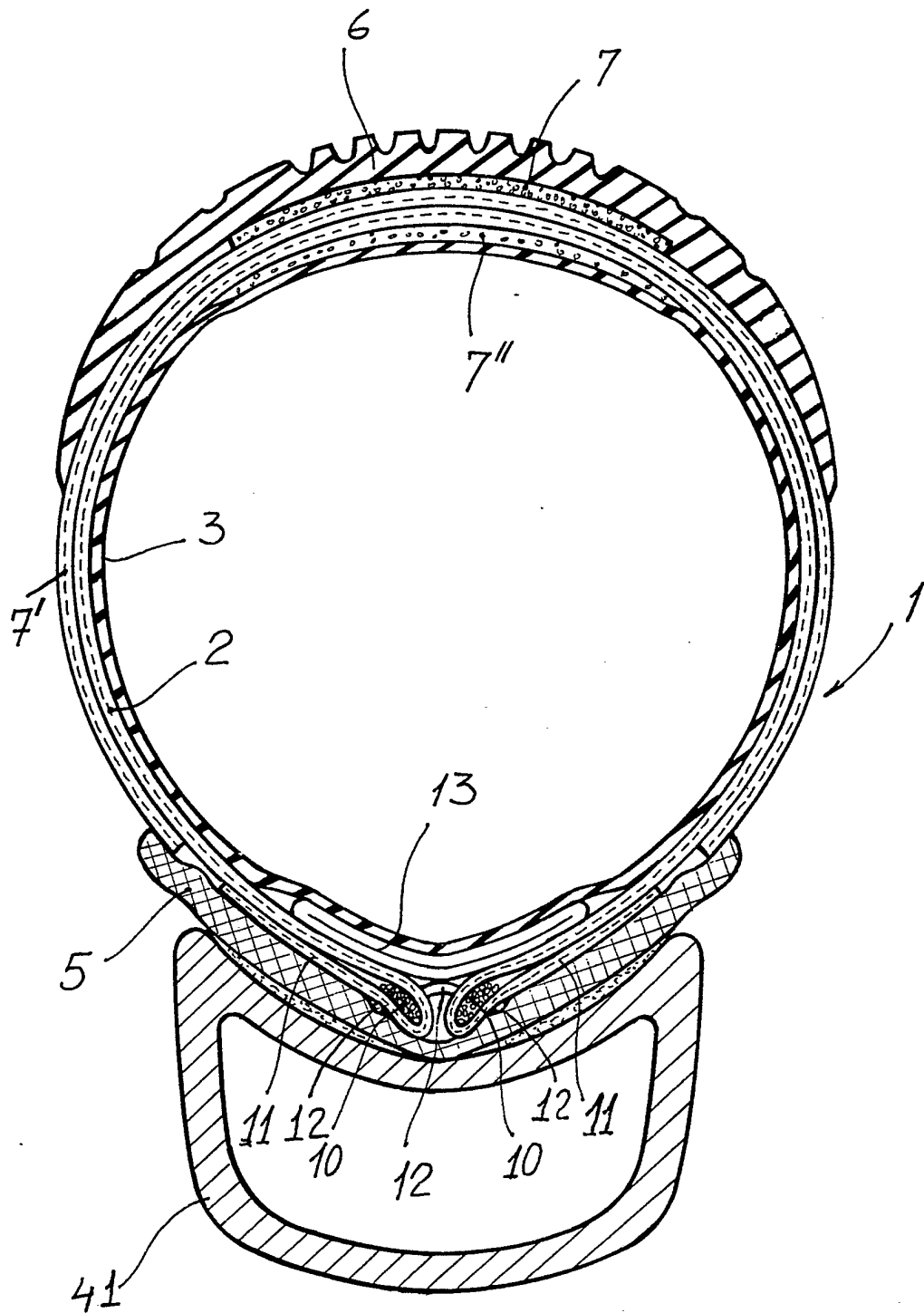
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(54) **Tubular tyre for cycles in general
and in particular for racing bicycles**

(57) The tyre comprises a toroidal casing 2 incorporating an air chamber 3, a protective strip 5 between the casing 2 and a rim 41, and a tread 6. At or adjacent the radially innermost part of the casing, in the vicinity of the joined edges 11 of the casing 2 there is at least one circumferentially extending reinforcing ring 10 constituted by a plurality of filaments having a high tensile strength. The edges 11 are joined by stitching 12 and the rings 10 prevent the tyre coming off the rim on deflation. The rim may be provided with grooves for improving the housing and anchorage of the rings 10.



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Fig-1

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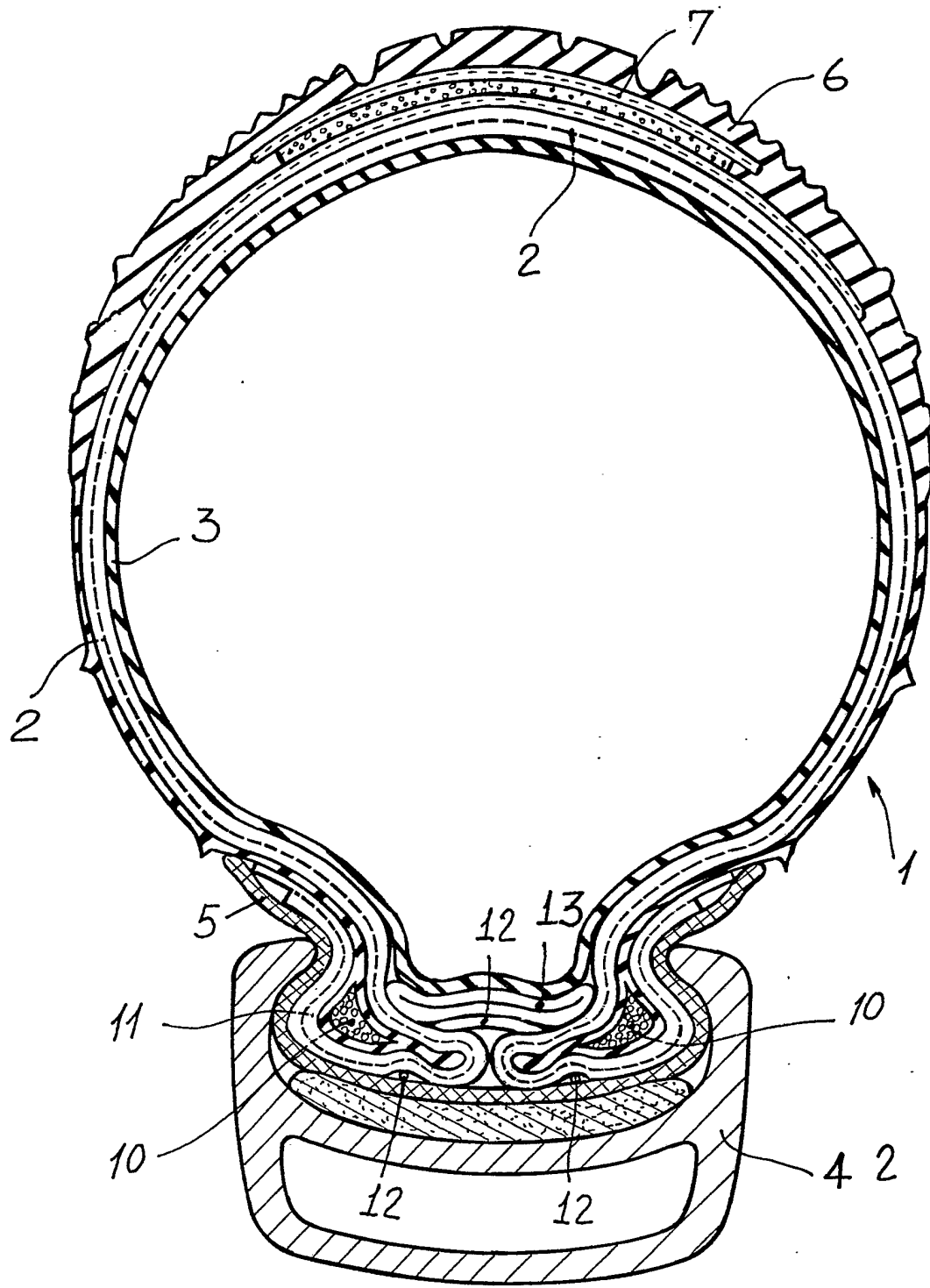


Fig-2

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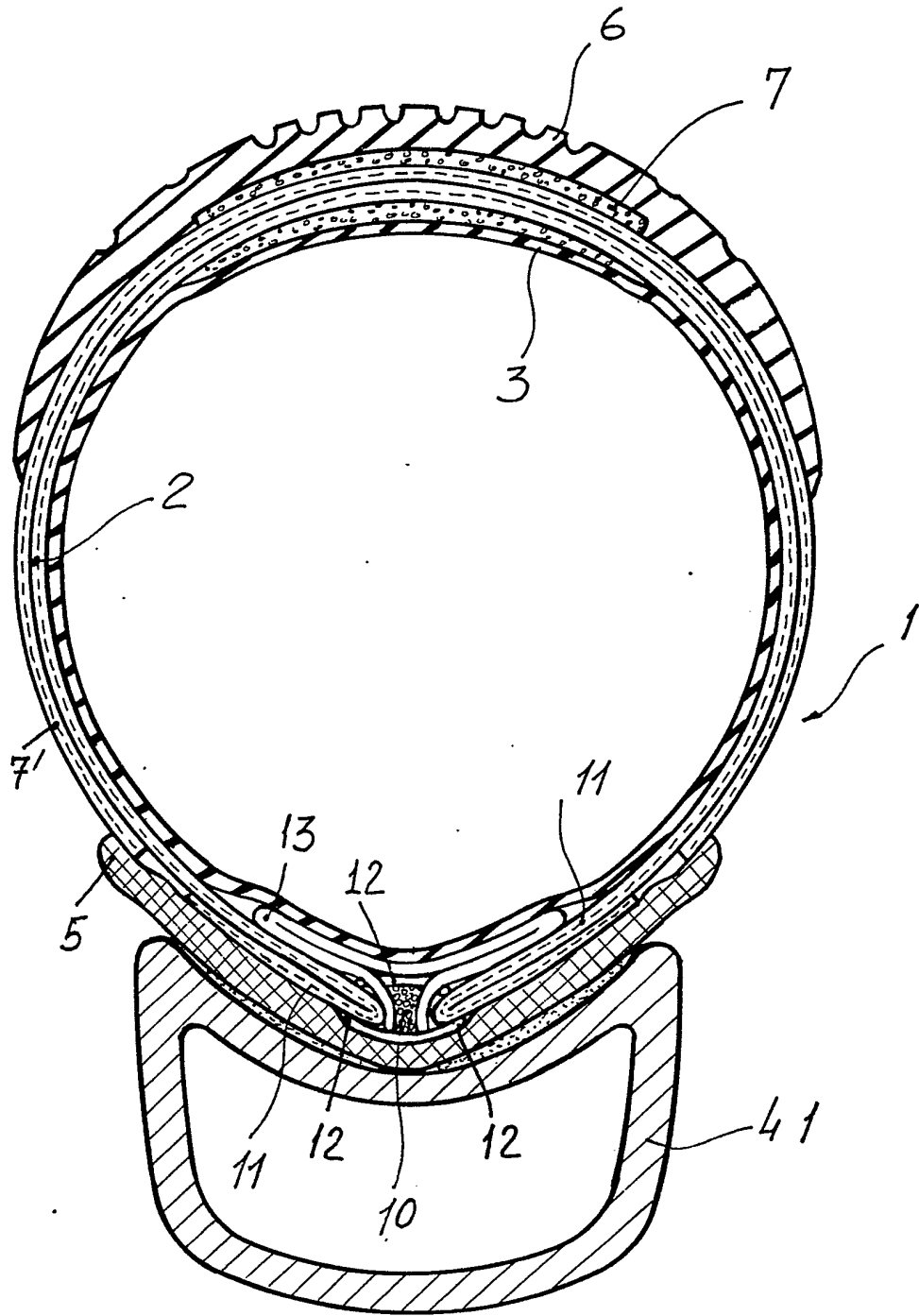


Fig- 3

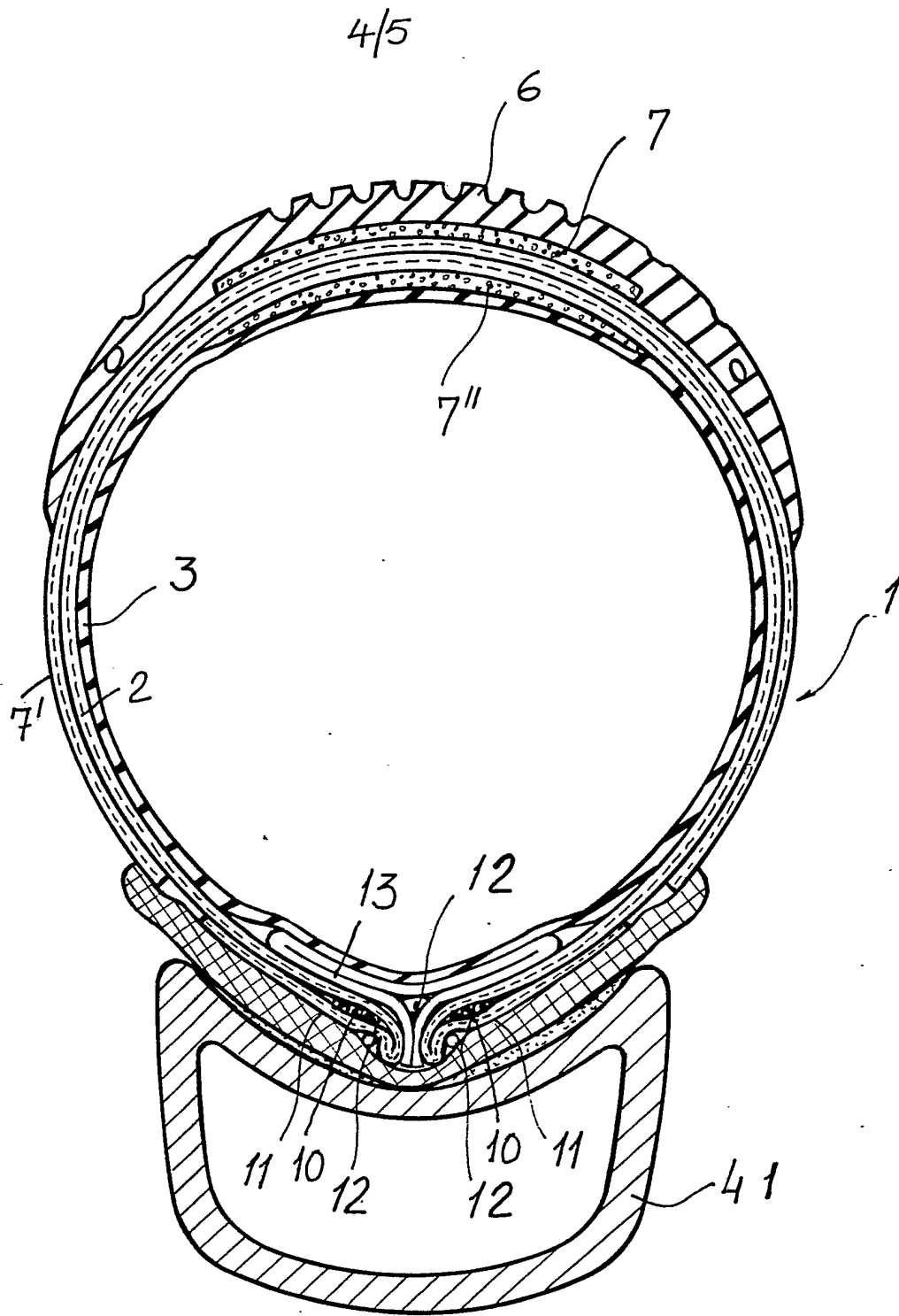
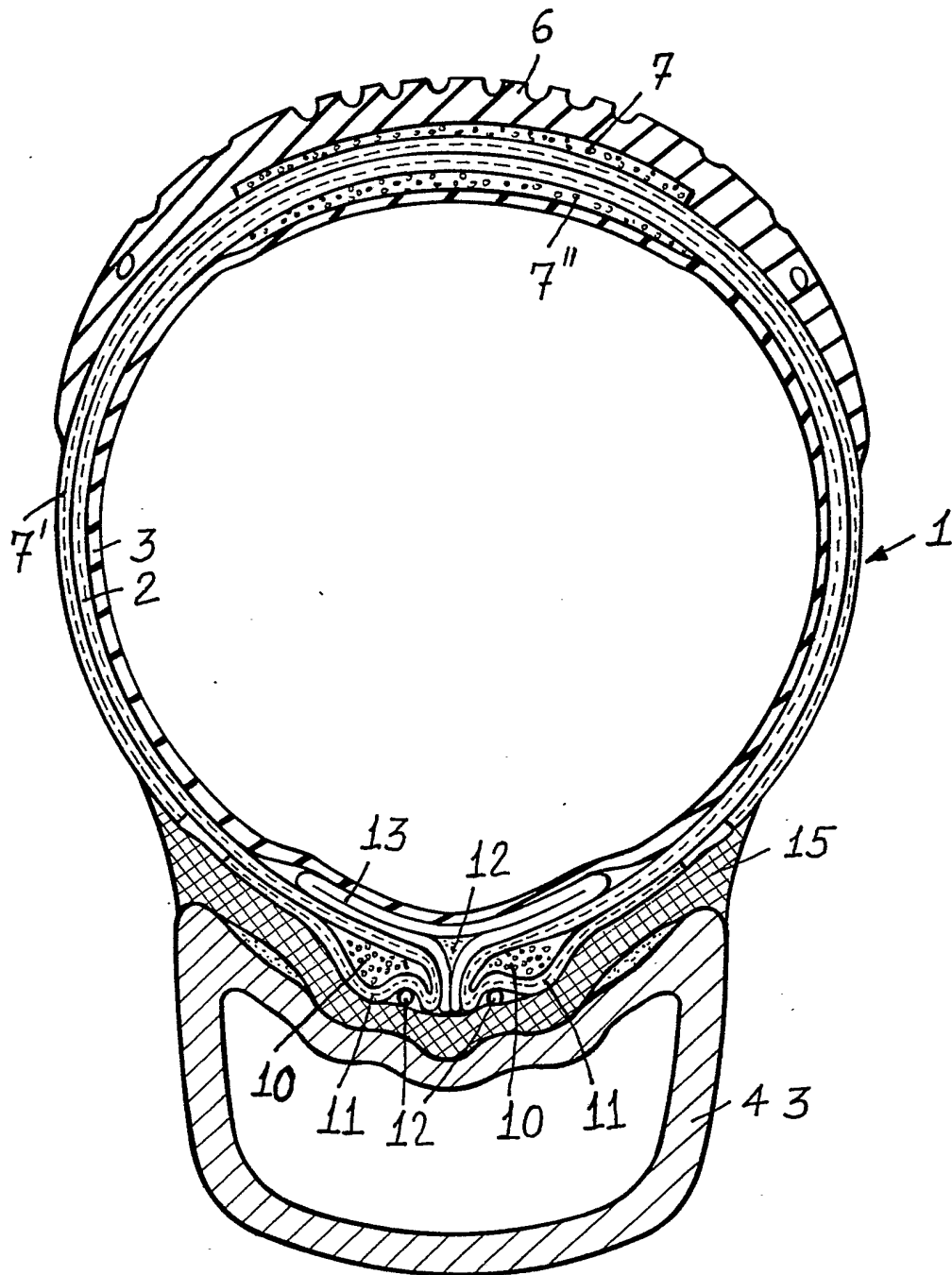


Fig-4

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Fig-5

SPECIFICATION

Tubular tyre for cycles in general and in particular for racing bicycles

5 The present invention relates to a tubular pneumatic tyre suitable for cycles in general, and especially suitable for racing bicycles.

Bicycles for general use have wheels with rims
10 shaped to receive and retain the wire beads of an outer cover which encloses an inflatable inner tube. Racing bicycles, on the other hand, are usually fitted with tyres of a much lighter type known as "tubular" tyres, in which an air chamber or inner tube is en-
15 tirely surrounded by a fabric casing, usually made of cotton, but sometimes silk.

The basic type of tubular tyre is generally constituted by a toroidal fabric casing which surrounds an air chamber or inner tube and which is protected from
20 abrasion against the rim of the wheel by an outer protective base tape and is provided on its radially outermost part with a tread which, in the most valued tyres, incorporates or overlies one or more fabric layers for protection against punctures.

25 Many constructional improvements have already been introduced into the basic tubular tyre by utilising natural and/or synthetic yarns and/or rubbers, as well as a whole series of improvements which have been taken from other technologies.

30 The majority of these improvements were directed towards a reduction in the costs of production, to widening the use of tubular tyres themselves, as well as to making them more attractive to users by improving the performance of such tyres, particularly as far
35 as their durability is concerned.

In particular, the bands forming the casing originally made from several pieces of rubberised fabric cut on the bias with an angle of about 45°, have subsequently been formed by superimposing at least
40 two layers of closely adjacent rubberised threads crossing one another, which are then cut on the bias and formed into a band. To form a toroidal casing from such a band the circular edges were initially brought together and sealed, with the possible fitting
45 of a sealing band; subsequently, however, the edges have been joined by sewing them together after having first preliminarily hemmed them either externally or internally. Again an inner protective band may be positioned between the sewn edges and the air
50 chamber. Sewing the edges together to form the toroidal casing also has the advantage of making it possible, by unstitching, to gain access to the inner tube to effect repairs after a puncture which was not possible with a sealed casing. It is also possible to
55 change a valve if this becomes necessary.

Fabrics were also provided to give some protection against punctures; initially these were constituted by strips disposed both internally and externally of the casing in the region of the tread, but subsequently
60 they became, as for example is illustrated in Italian Patent application No. 22 158 A/84 by the same applicant, true and proper fabric layers without discontinuities, which extend circumferentially and are disposed to protect not only the region of the tread,
65 but possibly also the side walls, going as far as to link

up and join with the base tape or being interposed between the edges and folded over with these.

This latter fabric, if made with the warp threads of the weave disposed radially, that is to say, orthogonal to the direction of movement, acts to reinforce the tyre cross-section, reducing deformation thereof, as well as improving the road holding of the tubular tyre in use. If, on the other hand, this latter fabric has warp threads disposed circumferentially,
75 that is to say in the direction of the movement, they act as further bracing for the tread, improving the resistance to puncturing and lowering the rolling resistance of the tubular tyre in use.

The present invention seeks to improve the already
80 considerable safety characteristics of a tubular tyre and to make it possible to use such a tyre, even on a rim intended for conventional tyres with an inner tube and an outer cover, having in all cases high safety properties in that it is almost impossible for the tyre to come off the rim even in the event of accidental rapid deflation when going downhill or in a curve. In the event of the accidental puncturing of a tubular tyre, this is subject to a more or less rapid deflation which, if the tyre is not securely adhesively
90 retained to the rim with suitable mastic or adhesive, it can come off from the rim, particularly if the tolerances and dimensions of the casing and associated base tape are at the maximum limit and those of the rim at the minimum limit.

95 A particular feature of the present invention is that it can be used on a normal rim for tubular tyres, or one provided with a groove deeper by 2 or 3 mm than those normally provided on tubular tyre rims, or on a conventional rim intended for cover-type con-
100 ventional tyres.

According to the present invention, there is provided a tubular pneumatic tyre comprising a toroidal casing constituting or incorporating an air-impermeable chamber having a protective base tape
105 on the radially innermost portion of the tyre cross-section, facing the rim of a wheel when fitted thereto, and a tread on the radially outermost portion of the tyre cross-section in which there is at least one reinforcing ring constituted by a plurality of filaments
110 of high mechanical strength, extending circumferentially around the toroidal casing.

A feature of the present invention is that it allows the use of an outer protection tape in which the characteristics of economy and protection from abrasion,
115 as well as adhesiveness to the casing and/or to the rim can be emphasised, the requirements for circumferential reinforcement no longer being of primary importance.

Embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a cross-section of a tubular tyre formed as a first embodiment of the invention, fitted to a tubular tyre rim;

125 *Figure 2* is a cross-section of a tubular pneumatic tyre formed as a second embodiment of the invention fitted to a light cover rim;

Figure 3 is a cross-section of a tubular tyre formed as a third embodiment of the invention with a single circumferential reinforcement ring;
130

Figure 4 is a cross-section of a tubular tyre formed as a further embodiment of the invention having two adjacently disposed circumferential reinforcement rings with an inner tape interposed between them;

5 and

Figure 5 is a cross section of a tubular tyre with two reinforcement rings located radially outwardly of the stitching, mounted on a special grooved rim which is also the subject of the invention.

10 In the different figures of the drawings, which show different embodiments of the invention, the same reference numerals have been used to identify the same or corresponding components.

With particular reference now to *Figure 1* of the drawings, the pneumatic tyre indicated generally with the reference numeral 1 has a toroidal casing 2 which encases within its interior an air chamber or inner tube generally indicated 3, also of toroidal form. Between the toroidal casing and the rim of the wheel, indicated 41, is a protective strip 5, whilst on the radially outermost part of the casing it is protected by a tread 6.

On the radially outermost part of the casing 2 there are three fabric layers, a first layer 7 on the outside, under the tread 6, a second fabric layer 7' again on the outside of the casing 2, but under the first fabric layer 7, the second layer 7' extending round the casing to meet up with the inner protective strip 5, and a third fabric layer 7" on the inside of the casing 2, between this and the inner tube 3 constituting the air chamber.

The edges of the casing 2 are folded over to form hems 11 and these hemmed edges are then sewn together with a stitching thread 12. An inner band of tape 13 is provided between the air chamber 3 and the joined edges of the casing 2. Within the hemmed edges 11 there are respective "soft" reinforcing rings 10 of filaments, preferably made of kevlar (R.T.M.) or other fibres having a high resistance to tension. The term "soft" is intended to define a reinforcing ring the cross-sectional shape of which is not defined in a hard and fast shape so that as the tubular tyre is flexed in use or as it is fitted to the rim the cross-sectional shape of the reinforcing rings can change. This is demonstrably the case if the reinforcing rings 10 are composed of a bundle of filaments all extending circumferentially since these can clearly change their relative positions when acted on by forces transverse their length.

These filaments are positioned so as to exert a "betting" action, that is a circumferential reinforcement which prevents the tyre from coming off the rim more certainly than has hitherto been the case with known tubular tyres.

The embodiment of *Figure 1*, has two rings 10, one in each of the folded or hemmed edges 11 of the casing 2, in the region of the stitching 12 under the inner band of tape 13. In this embodiment the reinforcing rings 10 are held by the sewn edges 11 of the casing 2 in a position close to the median plane of the rim 41 orthogonal to its axis.

With specific reference now to *Figure 2* there is shown a second embodiment for use on a rim 42 for conventional light pneumatic tyre covers. In this embodiment the reinforcing rings, again identified with

the reference numeral 10 are provided within the hemmed edges 11 which are joined by the stitching thread 12 in such a way as to allow the rings 10 to lie further apart in such a way as to press the radially inner parts of the tubular tyre under the anchoring lips of the channel of the rim 42.

70 With particular reference to *Figure 3*, here there is provided a single reinforcing ring 10 which is positioned between the sewn edges 11 with the stitching thread 12 passing radially outwardly of it. The internal tape 13 has its longitudinal edges folded outwardly on either side of the ring and joined with the hemmed edges 11 of the casing by the stitching thread 12. The tubular tyre thus has a securely located single reinforcing ring 10 coincident with the median plane of the rim 42.

With reference to *Figure 4*, there are provided "soft" rings 10 for reinforcing a tubular tyre, positioned in the central portion within the hemming 11, but outwardly of the stitching 12 in the sense that the stitching threads or cords 12 lie between the reinforcing rings 10 and the edges of the casing 2. As in the embodiment of *Figure 3* the longitudinal edges of the inner tape 13 are interposed between the edges of the cover 2.

90 The reinforcing rings 10 are, in each of the above embodiments, suitably pre-tensioned or formed on a production drum with a diameter such as to permit them to be fitted to the rim of the wheel with the tubular tyre deflated and flattened and the reinforcing rings 10 stretched to the maximum acceptable limit of elongation under load. Once positioned in the channel of the rim the rings 10 can exert their reinforcing effect to retain the tyre from coming off the rim.

The filaments of the reinforcing rings can be provided as projecting, raised beads and/or may be embedded in the structure of the outer protection strip.

With the described arrangement, the reinforcing and tyre retaining functions, now being performed by the rings 10, the outer protection base tape 5 can become a simple preformed flap of the most simple type, in plastomeric or elastomeric materials or rubberised fabric or other suitable material. Moreover, this outer base tape can be drawn, moulded or otherwise formed in any particular shape and can possibly be conceived as a ribbon of tear strip normally known in commerce with the Trade Mark Velcro. Possibly the base tape 5 may be formed in non-woven fabric, expanded cellular material, possibly coupled to a semi-rigid support, non-woven or woven fabric and so on, and possibly may be preliminarily provided with adhesive to be wound for one or more turns in the channel of the rim, also providing protective functions against abrasion and puncture as well as for improving the adhesion of the tubular tyre to the rim in use, and therefore under dynamic and thermal stresses.

It is moreover, possible to provide a rim for tubular tyres with one or more grooves or circumferential slots for improving the housing and anchorage of the soft rings 10, particularly for wheels intended for professional competition on track or road. In *Figure 5* there is illustrated a rim 43 for tubular tyres, provided with three circumferential grooves 14 obtained, for

example, by rolling whereby not to reduce the thickness of the bottom wall of the channel, on which there is mounted on a tubular tyre provided with two soft rings 10 and a shaped base tape 15 formed in a particular shape and having the function of ensuring a more secure connection between the rim and the tyre.

The possible accentuation of the depth of the channel of the rim for tubular tyres over that conventionally used allows both the tubular tyre of the invention, which stretches less upon deflation than known tyres due to the presence of the soft reinforcing rings 10, or a conventional tubular tyre to be fitted thereon. Moreover, there has been described the possibility of forming in a rim for tubular tyres, one or more circumferential grooves or slots lodging and improving the anchorage of the soft rings, without however, prejudicing the use of a conventional tubular tyre.

The presence of the soft rings also gives the possibility of using an extremely simple protective base tape, of which are demanded only the functions of protection, anti-abrasion, and adhesion between the tubular tyre and the rim. It is appropriate to emphasise that, even although hereinabove explicit reference has been made to tubular tyres for bicycles, the use of tyres described hereinabove is not to be limited to bicycles, but must be extended to any other tyre for any type of vehicle having one or more wheels. Moreover, the above explained concept, manifesting itself in the application of soft reinforcing rings, can also be extended to the field of pneumatic or hydraulic sealing packings in which, for example, by the effect or in the presence of dynamic stresses, it may be necessary to provide a particularly effective anchorage to a frame.

CLAIMS

1. A tubular pneumatic tyre comprising a toroidal casing constituting or incorporating an air-impermeable chamber having a protective base tape on the radially innermost portion of the tyre cross-section, facing the rim of a wheel when fitted thereto, and a tread on the radially outermost portion of the tyre cross-section, in which there is at least one reinforcing ring constituted by a plurality of filaments of high mechanical strength, extending circumferentially around the toroidal casing.

2. A tubular pneumatic tyre as claimed in Claim 1, in which there are provided two such filamentary reinforcing rings spaced from one another parallel to the axis of the tyre such as to be able to constitute retaining cores for fitting the tyre onto a rim for high pressure covers.

3. A tubular pneumatic tyres as claimed in Claim 1 or Claim 2, in which the said protective base tape has warp threads or cords which offer a high resistance to longitudinal tension, the said threads or cords projecting from and/or being incorporated in the thickness of a woven or non-woven textile fabric having solely the function of protecting the casing from abrasion.

4. A tubular pneumatic tyre as claimed in any of claims 1 to 3, in which the said protective base tape is

constituted by a non-woven fabric or a moulded or otherwise formed plastomeric or elastomeric material.

5. A tubular pneumatic tyre as claimed in any preceding claim, in which the said protective base tape is constituted by a tear ribbon for the anti-friction and anti-separation coupling between the tubular tyre and the rim.

6. A tubular pneumatic tyre as claimed in any preceding Claim, in which the casing is formed from at least one circular band the longitudinal edges of which are sewn together to form the band into a toroid.

7. A tubular pneumatic tyre as claimed in Claim 6, in which the longitudinal edges of the casing band are folded over to form a hem and the filamentary reinforcing rings are positioned in or adjacent the longitudinal folds constituting the hems.

8. A tubular pneumatic tyre as claimed in Claim 7, in which the sewing thread joining the edges of the casing passes through the casing radially inwardly of the filamentary reinforcing rings.

9. A tubular pneumatic tyre as claimed in Claim 7, in which the sewing thread joining the edges of the casing passes through the filamentary reinforcing rings, passing between the adjacent filaments thereof.

10. A tubular pneumatic tyre substantially as hereinbefore described with reference to, and as shown in, any of Figures 1 to 5 of the accompanying drawings.

11. A rim for a tubular pneumatic tyre as claimed in any preceding Claim, having at the bottom of its tyre-receiving channel, at least one groove engageable by the said filamentary reinforcing rings.

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ABSTRACT:

CHG DATE=19990617 STATUS=O> The tyre comprises a toroidal casing 2 incorporating an air chamber 3, a protective strip 5 between the casing 2 and a rim 41, and a tread 6. At or adjacent the radially innermost part of the casing, in the vicinity of the joined edges 11 of the casing 2 there is at least one circumferentially extending reinforcing ring 10 constituted by a plurality of filaments having a high tensile strength. The edges 11 are joined by stitching 12 and the rings 10 prevent the tyre coming off the rim on deflation. The rim may be provided with grooves for improving the housing and anchorage of the rings 10. □